Jerome Johnson-EPA

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STATE OF MISSOURI
Mel Carnahan, Governor • Stephen M. Mahfood, Director
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL QUALITY
P.O. Box 176 Jefferson City, MO 65102-0176

January 18, 2000

CERTIFIED MAIL # Z 290 181 338
RETURN RECEIPT REQUESTED

Mr. Joseph Haake
Group Manager
Environmental and
Hazardous Materials Services
Boeing Company
P.O. Box 516
St. Louis, MO 63166-0516

RE: Draft RCRA Facility Investigation Report for McDonnell Douglas, St. Louis, Missouri, Permit #MOD096726484 incorrect ID#

Dear Mr. Haake:

The Missouri Department of Natural Resources' (MDNR) Hazardous Waste Program (HWP), in coordination with Region VII of U.S. Environmental Protection Agency (EPA), has completed review of the draft RCRA Facility Investigation (RFI) Report dated June 18, 1998. The draft RFI Report was prepared following the HWP's approval of the RFI Work Plan on November 24, 1997, and Boeing's implementation of the approved work plan. The draft RFI Report was reviewed within the context of the approved RFI Work Plan and the State Hazardous Waste Management Facility Part I Permit requirements.

As you are aware, investigations performed pursuant to the RFI Work Plan must ultimately be sufficient to address the RFI objectives contained in Corrective Action Condition VI. of the Part I Permit. In general, the draft RFI Report satisfactorily addresses the specific elements of investigation as they relate to individual Solid Waste Management Units (SWMUs) #10, #21, #26, and #31 which were investigated under the approved RFI Work Plan. Thus, no further investigation of these SWMUs is necessary at this time. Based on review of the draft RFI Report, the HWP/EPA have determined that SWMU #17 (Transferred Area for Recovered PCE) requires additional investigation relative to the extent of soil and groundwater contamination. Comments concerning specific deficiencies in the draft RFI Report and related investigation are provided below. The draft RFI Report is hereby disapproved until all of the following RFI-related comments are satisfactorily addressed.

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TECHNICAL COMMENTS:

General Comments:

1. The climatological, air quality and meteorological conditions of the facility are not included in the RFI Report. These elements of the environmental setting should be briefly addressed in the final RFI Report in accordance with Part I of the Hazardous Waste Management Facility Permit. Much of this information may obtained from the facility's RFA Report and can be excerpted, as appropriate, to satisfy the RFI requirements.

2. Although perchloroethylene (PCE) and tetrachloroethene are the same constituents, the final RFI Report should consistently refer to either perchloroethylene (PCE) or tetrachloroethene throughout the report.

3. The RFI Report does not discuss all elements bearing on migration of groundwater contamination and attenuation/retardation factors at SWMU #17. These elements are related to the determination of aquifer parameters, including groundwater flow direction, hydraulic conductivity, gradient and effective porosity. Site-specific aquifer parameters should be used to calculate average linear groundwater velocity. These calculations should be used to infer contaminant movement and fate via advection. The calculations coupled with site-specific estimates of attenuation/retardation should be presented in the final RFI Report in support of the three dimensional conceptual model of the groundwater contaminant plume.

   It is acceptable to estimate contaminant migration rate(s) based on the aquifer properties established during the hydrogeologic investigation and the associated average linear (advective) groundwater flow velocity (v) as defined by the equation $v = Ki/n_e$, where (K) is hydraulic conductivity, (i) is hydraulic gradient and (n_e) is effective porosity. Using this equation, the estimated rate of contaminant migration or range of rates of migration (if Boeing chooses to calculate a range by varying the input parameters) will be equivalent to the bulk rate of movement of the local groundwater. Any migration rates calculated in this fashion should be compared with direct rate measurement information (i.e., distance from the known point of release to the outermost downgradient perimeter of the contaminant plume divided by the number of years since the release) to ensure that the calculated versus measured rates are reasonably comparable and/or to provide the foundation for any discussion by Boeing of plume attenuation or retardation. It should also be recognized that migration of PCE in the subsurface as a free phase may not be governed by the bulk flow of groundwater and may be influenced to a large degree by the presence of

relatively impermeable zone of earth material (e.g., clays, competent bedrock, etc.). The potential presence/absence of free product, and if potentially present, those factors bearing on fate and transport of such product in the subsurface need to be discussed in the RFI.

4. Given the nature of the geologic/study data that bears on the conclusions and recommendations presented in the draft RFI Report, the HWP requires the final RFI Report be properly sealed/stamped by a geologist registered in Missouri in accordance with the law and rules as administered by the Board of Geologist Registration.

5. When collection of additional subsurface contaminant data from further investigation at SWMU #17 is completed, the final RFI Report must include updated hydrogeologic cross-sections to reflect all current subsurface contaminant information. The revised cross-section(s) must include detailed lithologic information and potentiometric surface data (i.e., static water elevation information). Upon completion of additional investigation, Boeing must develop and submit visual representations of the extent of soil and groundwater contamination at the site incorporating all pertinent data. Such representations should include, but not necessarily be limited to, contaminant isoconcentration or extent maps for both horizontal and vertical profile, tabular summaries of groundwater/soil analysis results and contaminant trend graphs. In the future, these depictions of the site subsurface conceptual model should be routinely updated and submitted as part of Boeing's corrective action deliverables as new data is collected and assimilated.

Specific Comments:

6. **Section 4.4, Table 4-2.** Boeing's Investigation Threshold Level (ITL) for Barium in soils is listed as 1750 mg/kg in Table 4-2, while Tables 7-2, 7-6, 7-7, 7-10, 7-12, and 7-14 list Boeing's ITL for barium as 1600 mg/kg. The final RFI Report must address this discrepancy.

7. **Section 4.4, Investigation Threshold Limits (ITLs), Page 4-3.** The HWP generally agrees with use of EPA's Superfund Soil Screening Levels (SSLs) of July 1996, with a dilution and attenuation factor (DAF) of 20, which corresponds to the degree of dilution and attenuation of contaminant from soil to the receptor point, as ITLs to guide investigation of the extent of release of hazardous waste and/or hazardous constituents from the subject SWMUs to the environment. However, the fourth paragraph of this section indicates that, for "ubiquitous metals," the USGS-based regional background concentrations of metals in soil in St. Louis County (Geochemical Survey of Missouri, USGS, 1984) were utilized

as ITLs if greater than EPA's SSL criteria. While the definition of "ubiquitous metals" was not provided, Boeing should note that one background soil sample was previously collected midway between SWMUs #1 and #2 during closure of these two SWMUs on December 6, 1993, and another background soil sample was collected at SWMU #3 during the closure investigation for heavy metals analysis. This information is presented in the facility's RFA Report. Given the RFI objective and that the referenced USGS information is generally for shallow agricultural soils, the site-specific and/or near-site background soil data shall be used to justify soil screening levels in excess of SSLs.

8. **Section 7.2.1, Geological Cross-Section for SWMU #17.** The hydrogeological interpretations presented in this section indicate that the low vertical permeability of the Clay Unit found at SWMU #17 provides hydraulic separation from the underlying bedrock. This conclusion is based only on review of the physical properties of the soil samples acquired from the RFI soil boring and is not supported by laboratory or in-situ testing. The hydraulic interconnection, or lack thereof, with lower saturated zones and/or bedrock has not been definitively demonstrated. Despite the apparent continuity and significant thickness of clay unit present across the site, the HWP believes that hydraulic interconnection with lower saturated zones is evident at SWMU #17 as supported by the RFI analytical data which indicates higher concentrations of chlorinated solvents in deeper intervals of the saturated clay zone when compared with the shallow zone. This may be indicative of higher vertical permeability in the clay unit than indicated which could represent a naturally occurring condition and/or be the result of free phase PCE contact with the clay unit and resulting desiccation of the clays. Boeing's conclusions regarding definition of the actual extent of groundwater contamination remains incomplete and must be verified via further investigation. Further investigation of the horizontal and vertical extent of groundwater contamination and evaluation of the impact of free phase solvents, (if any) on the permeability of the clay unit (i.e., creation of secondary porosity features) must be performed to support the hydrogeologic interpretations at SWMU #17.

9. **Section 7.2.2, Analytical Results for SWMU #17 Soil Samples.** The analytical results for volatile organics in soils collected from Borings B1, B2, B3, B4, B5 and B6 at SWMU #17 are incomplete. The uninterpreted laboratory data for several volatile organic constituents, including 2-butanone, ethylbenzene, methylene chloride, toluene, 1,1,2-trichloroethane and trichloroethene shown on Table 7-1 are not provided or discussed in the draft RFI Report. These constituents are volatile organics, which were apparently analyzed by test method SW-8240 as specified in the approved RFI Work Plan, but were not reported in full. This makes the RFI findings, including the report conclusions,

more difficult to evaluate since the report does not present all relevant investigation data. The summary and conclusions related to SWMU #17 must be considered incomplete without this information.

Irrespective of the data "incompleteness" at SWMU #17, the HWP/EPA have determined that additional investigation is warranted based on the information which has been provided for SWMU #17. It is evident from the soil analytical data obtained from the deeper portions of the soil borings at SWMU #17, that the vertical extent of soil contamination is not adequately defined. For example, PCE was detected in the soil samples acquired from the deeper portions of several borings at concentrations two to four orders of magnitude (1100 ug/kg to 240,000 ug/kg) above Boeing's ITL of 60 ug/kg. Other VOCs, including cis-1,2-dichloroethene at 11900 ug/kg in soil boring S17B4, methylene chloride at 69 ug/kg in boring S17B10, and trichloroethene at 7900 ug/kg in S17B9 were also detected in the deeper portions of the noted borings at concentrations which exceed Boeing's ITLs of 400 ug/kg, 20 ug/kg, and 60 ug/kg, respectively. In addition, the horizontal extent of soil contamination has not been adequately defined around the unit, especially to the east of SWMU #17.

While some of the analytical results are missing, the last paragraph of this section indicates that several soil-associated chemicals of concern, including cis-1,2-DCE, trans-1,2-DCE, PCE, 1,1,2-trichloroethane, and TCE were retained for evaluation in the risk assessment. The HWP generally agrees with inclusion of these compounds, however, evaluation of the missing data requested and adequate delineation of the horizontal/vertical extent of soil contamination at SWMU #17 is necessary to include/exclude other soil-related contaminants and to provide for an adequate risk assessment. Although methylene chloride was excluded from evaluation in the preliminary risk assessment based on the presumption of a laboratory artifact, Boeing must acknowledge in the final RFI Report that methylene chloride was detected in two soil samples from S17B10 boring at various depth intervals (4'-5' and 14'-15') at concentrations of 24 ug/kg to 69 ug/kg, respectively, which exceeds Boeing's ITL of 20 ug/kg. Methylene chloride was found in the laboratory method blanks for the S17B9 samples, but not in the S17B10 samples. The HWP can not verify the laboratory artifact for methylene chloride since the Quality Assurance/Quality Control (QA/QC) data for the soil sample obtained from S17B9 and S17B10 borings are not included in the draft RFI Report. Further support for Boeing's conclusions must be provided in the final RFI Report.

The development of the list of chemicals of concern and risk assessment may need to be revised in the future to account for the toxicity and associated risk of any degradation products of chlorinated solvents (e.g., vinyl chloride) if

subsurface conditions have changed. The significant concentration of contaminants found in the soil at SWMU #17 may act as a source for continued groundwater contamination.

10. **Table 7-1 and Associated Boring Logs (Appendix A).** The depth intervals at which the soil samples were collected from borings SB-5 and SB-7 at SWMU #17 as presented in Table 7-1, are not indicated on the referenced boring logs. Please indicate the sampling depths on the boring logs in the final RFI Report.

11. **Section 7.2.3, Page 7-3.** The second paragraph of this section states "MW-5 provided analytical data regarding shallow groundwater ... MW-6 was used to characterize groundwater conditions from a deeper portion of the saturated unit." MW-5 is the deep well and MW-6 is the shallow well as later stated in the fifth paragraph of this section, Table 7-3, and Figure 7-1. The field borehole logs indicate that MW-5 is the deep well and MW-6 is the shallow well. This discrepancy must be corrected in the final RFI Report.

12. **Section 7.2.3, Page 7-5 Analytical Results for SWMU #17 Groundwater Samples.** The third paragraph of this section states that "A downgradient boundary was established to the northeast of SWMU #17 where no VOCs were detected from TP-3." The potentiometric surface map shown on Figures 7-5, 7-6, and 7-7 indicates a groundwater flow direction toward the east of SWMU #17, not to the northeast towards TP-3. TP-3 appears to only generally define the cross gradient boundary of the plume, not where the leading edge of the plume could be located. The eastern downgradient boundary of the plume still remains undetermined. Additional groundwater monitoring points must be established downgradient of MW-5 and MW-6 (contaminated wells) in both the shallow and deeper portions of the uppermost aquifer to define the horizontal and vertical extent of contamination and to provide a better estimate of the rate of groundwater plume migration.

13. **Section 7.2.3, Pages 7-5 and 7-6.** The groundwater analytical results indicate that TP-1 exhibits the highest PCE concentration of 210 mg/L. This concentration exceeds the PCE solubility limit of 200 mg/L, yet no collection techniques were employed at MW-6 to evaluate the potential presence of free product (DNAPL) in the subsurface nor is any discussion devoted to this topic in relation to the risk assessment for groundwater potential exposure (e.g., subsurface concentrations may exceed those used to calculate impacts to Coldwater Creek). Appropriate sampling and analytical procedures must be employed in an attempt to confirm or disprove the presence of DNAPL, and if present, further investigation will be necessary to determine the rate of

contaminant movement, extent of the DNAPL and impacts to the site-specific conceptual model, the risk assessment and ultimately corrective measures. In addition, the deep well (MW-5) exhibits the highest TCE concentration of 140 mg/L which is five orders of magnitude above EPA's Maximum Contaminant Levels (MCL) and Missouri Water Quality Standard of 0.005 mg/L for protection of human health and the environment. Based on the hydrogeologic conditions, chemical characteristics of PCE and daughter products, and data collected so far, it is evident that contaminants have been migrating vertically downward as well as horizontally downgradient of SWMU #17 to the east. Given the apparent hydraulic interconnection of the unconsolidated units comprising the uppermost aquifer and the presence of high levels of chlorinated solvents in the lower portion of the monitored unit, vertical migration of dissolved contaminants and/or DNAPL in the underlying units, including the bedrock is quite plausible. The data presented in the RFI Report does not conclusively support definition of the vertical/horizontal extent of groundwater contamination, and additional investigation, including the installation of monitoring wells in both the shallow and/or deeper portions of the uppermost aquifer is required.

Boeing cannot predicate completion of site characterization based on one groundwater sampling event to define the trend and vertical/horizontal extent of releases. Unless the contaminants of concern, including the presence of DNAPL, are adequately characterized and the number, location and depth of monitoring wells are sufficient to support the 3-dimensional conceptual model of groundwater flow at SWMU #17, the RFI Report will be insufficient to meet the RFI objectives contained in Corrective Action Condition VI. of the Part I Permit. Further characterization to address the RFI objectives including additional monitoring wells/piezometers and groundwater sampling will be required.

14. **Section 7.2.3, Pages 7-6.** It is indicated in this section that methylene chloride will be removed from further consideration with respect to SWMU #17 because it was likely associated with laboratory carryover. The statement can be true, but needs to be supported by the positive detection of methylene chloride in the QA/QC samples in order to be considered as the basis for elimination of this compound as a contaminant of concern. The next round of sampling/testing for VOCs could provide further explanation to discount or include methylene chloride from further investigation. As indicated in Comment 9, methylene chloride was detected in the soil samples from S17B10 boring, and not found in the laboratory method blank. In addition, no QA/QC sampling data for the groundwater samples obtained from MW-5 and MW-6 was found in the draft RFI Report to support the above statement. Methylene chloride was detected at one piezometer (TP-1) and two wells (MW-5 and MW-6) at concentrations exceeding Boeing's ITL. Even when present as lab artifacts, levels as a general rule rarely

exceed ITLs. Also, this statement was based on only one sampling event which makes it inconclusive to discount methylene chloride from further investigation without additional sampling data which is required to determine the rate of movement and vertical/horizontal extent of groundwater contamination.

15. **Section 7.2.3, Page 7-6.** The second paragraph on Page 7-6 indicates that other VOC constituents including acetone, benzene, ethylbenzene, methylene chloride, toluene, and xylenes were generally detected at low concentrations (e.g., 50 ug/l or less and/or on an isolated basis). However, this statement contradicts the VOC concentrations of such constituents shown on Table 7-3. Toluene and benzene were detected at TP-1 at concentrations of 1200 ug/l and 21 ug/l, respectively, exceeding Boeing's ITLs of 1000 ug/l and 5 ug/l respectively. In addition to chlorinated solvents, the groundwater-related VOC constituents exceeding Boeing's ITLs must be retained for further evaluation in the final RFI Report.

16. **Section 7.2.3, Page 7-6.** The third paragraph of this section indicates that the highest total VOC concentration detected at TP-1 was 308 mg/l. The HWP believes that the highest total VOC concentration at TP-1 should be higher (at least 317 mg/l) when the actual total VOC concentrations are added without factoring dilution into the sampling analysis. In addition, Table 7-3 only presents the VOC concentrations for toluene, trichloroethene and vinyl chloride detected at TP-1 after dilution. However, the laboratory analytical data presents actual concentrations for the referenced VOCs before dilution which appear to be significantly above Boeing's ITLs. The representative VOC concentrations must be accurately referred to and evaluated throughout the RFI Report including figures and tables.

    While the draft RFI Report acknowledges the detection of vinyl chloride only at MW-5 and MW-6 above Boeing's ITL of 0.002 mg/l, it fails to acknowledge the highest vinyl chloride concentration of 3.600 mg/l (5.0 mg/l with dilution factor) at TP-1, which is three orders of magnitude above Boeing's ITL. Vinyl chloride appears to be a degradation product of other chlorinated solvents, primarily PCE and TCE at SWMU #17, since TP-1 was installed at the source of the release.

17. **Section 7.2.5, Groundwater Elevation Data for SWMU #17, Page 7-7.** This section indicates that static water level data was collected from all the temporary piezometers during water elevation measurement events conducted on February 9 and 20, 1998. Additional water elevation measurement was conducted on April 22, 1998, after installation of two additional monitoring wells at SWMU #17 to acquire more data. The general groundwater flow direction appears to have been defined; however, the noted measurements do not

account for any seasonal or temporal fluctuations in groundwater flow conditions that might exist given the limited measurement period. In light of the substantial concentrations of contaminants in the groundwater, additional static groundwater elevation measurements are needed to support conclusions regarding groundwater flow direction(s), gradient(s) and to support the analysis of potential groundwater exposure pathways as part of the risk assessment.

This section indicates a pH value of 12.9 and conductivity value of 101,000 µs/cm were measured in groundwater from TP-4. No explanation of these elevated values is offered in the draft RFI Report. These elevated values may indicate the presence of grout in the monitored intervals of TP-4 which could compromise the representative nature of the samples/analysis obtained from this monitoring point. The field boring logs for the temporary piezometers at SWMU #17 lack information concerning the piezometer installation procedures which could indicate the cause of the anomalous pH and conductivity measurement. Further investigations of the groundwater are required to evaluate the nature and extent of contamination related SWMU #17 and to complete the final RFI Report.

18. **Section 8.2.1, Migration Mechanisms, Page 8-3.** This section indicates that due to the COC's low K_{oc} values, many of the volatile organic COCs are expected to be weakly adsorbed to the soils and sediment. This suggests that significant mobility of these organics in groundwater is probable. It is also suggested that the physical and chemical properties of the constituents present at the facility are such that volatilization, oxidation, biodegradation, and soil adsorption all important processes that may affect the fate and transport of constituents in the subsurface. With the exception of volatilization, these other factors may exert limited influence on the migration of COCs based on the high degree of chlorination and concentrations (including the potential presence of DNAPL) of PCE and TCE found in both soil and groundwater. Volatile constituents can potentially contribute to surface/subsurface gas releases to air. The Henry's Law constant of 0.02685 atm•m^3/mol at 25°C for PCE is relatively high. Rapid volatilization often occurs when the Henry's Law constant of a constituent is greater than 0.001 atm•m^3/mol. Solvents with a high degree of chlorination including PCE are not easily susceptible to oxidation, but usually can be degraded under reducing (anaerobic) conditions via reductive dechlorination. The RFI contains no discussion regarding the role of biodegradation (oxidation/reduction conditions) in the subsurface at SWMU #17. The migration of COCs in groundwater has/is occurring as evidenced by their presence in the downgradient wells (shallow and deep intervals). The rate of migration and horizontal/vertical extent of contaminant migration has not yet been adequately determined, nor has any substantive site-specific information been provided

concerning characterization of the noted contaminant fate and transport modifiers. Boeing's conclusions regarding the role of contaminant fate and transport modifiers must therefore be viewed as unsupported generalities.

19. **Section 8.2.2, Uncertainties Associated with Preliminary Risk Assessment, Page 8-14.** This section identifies the preliminary potential exposure routes for human receptors from impacted media at the facility that Boeing believes to be applicable. The HWP believes inhalation of vapors volatilized from contaminated groundwater and soil should be addressed as part of the revised risk assessment given the presence of high concentrations of dissolved phase contamination, including potential DNAPL, in the groundwater and soil. The volatilization potential of these contaminants should also be addressed when considering all plausible exposure routes and pathways.

20. **Section 8.2.3, Ecological Exposure Pathways, Page 8-5.** This section indicates that no water except uncontaminated cooling water, permitted storm water discharges, and excess wet-weather bypass discharges may be discharged to Coldwater Creek. This may be true from a regulatory standpoint; however, Boeing has not adequately demonstrated that contaminated groundwater from SWMU #17 is not discharging to Coldwater Creek. The horizontal and vertical extent of groundwater contamination from SWMU #17 has not yet been adequately defined. It is, therefore, premature to conclude without further evidence that Coldwater Creek is not being impacted by contaminated groundwater originating from SWMU #17. The RFI data collected to date from SWMU #17 indicates the presence of dissolved–phased constituents at significant concentrations and possibly free product (DNAPL) in the uppermost aquifer. Horizontal and vertical migration of groundwater contamination from SWMU #17 is evident in the lower portion of the uppermost aquifer, downgradient from the source. The groundwater elevation contour map for SWMU #17 indicates that the general groundwater flow direction is toward Coldwater Creek. Additional investigation, including the installation of monitoring points, will be required to establish contaminant extent and to assess potential contaminant discharges to Coldwater Creek. Figure 3-1, Layout of Facility and SWMU Locations, needs to be redrawn to scale to verify the location of SWMU #17 with respect to the nearest potential groundwater discharge point into Coldwater Creek.

21. **Section 8.4.2, Uncertainties Associated with Preliminary Risk Assessment, Page 8-14.** This section discusses the uncertainty analysis associated with preliminary risk assessment which is based on exposure assumptions related to human health and ecological toxicity. The RFI data collected to date indicates the need for further evaluation including focused investigation and monitoring to

define the rate of migration and horizontal/vertical extent of soil and groundwater contamination related to SWMU #17. The potential health risks associated with SWMU #17 have been calculated to exceed a Hazard Index of 1 and the carcinogenic target risk range of $1x10^{-4}$ to $1x10^{-6}$ based on future construction/utility worker exposure scenario. The target risk range of $1x10^{-4}$ to $1x10^{-6}$ ($1x10^{-6}$ point of departure) is exceeded based only on future construction/utility exposure through dermal absorption even though the exposure scenario fails to estimate potential carcinogenic risk via inhalation of VOCs from contaminated groundwater and soil (subsurface gas releases). Once characterization of SWMU #17 is complete, the risk assessment will need to be revised to consider all plausible exposure pathways and scenarios to ensure protection of human health and the environment.

22. **Section 9.1.1, Summary of Soil Results for SWMU #17, Page 9-1.** The first paragraph states that the horizontal extent of impacted soils at SWMU #17 was defined through the utilization of investigative soil borings, PID field screening, and soil analyses. The RFI data clearly indicates that the horizontal and vertical extent of soil contamination at SWMU #17 has not been adequately defined. The organic constituents detected in the soil samples acquired from Boring #10 exceed Boeing's ITLs at the deepest intervals. The analytical data presented in the draft RFI Report are not sufficient to define the full extent of releases to either soil or groundwater at SWMU #17. The evidence of soil contamination at the investigation limits of SWMU #17 at levels that significantly exceed Boeing's ITLs should have been accompanied by discussion, conclusions and/or recommendations for further investigation. No such narrative is presented in the RFI Report. Boeing's response to these comments must address this issue in relation to defining horizontal and vertical extent of soil impacts and the role of contaminants leaching from soil to groundwater and any associated contaminant exposure issues. Further characterization of the environmental releases at SWMU #17 is required to support development of the three-dimensional site conceptual model that satisfies the RFI objectives.

23. **Appendix C, Exposure Assumptions for Chemical Intake Estimates.** This appendix provides the exposure scenarios, equations, and assumption used to estimate intakes in the preliminary site-specific risk assessment process for the Boeing facility. As part of the assessment, Equation 10 of Section 4.6 in the referenced appendix was used to calculate the concentrations of constituents of concern associated with groundwater releases originating from SWMU #17 at the point of groundwater discharge to surface water in Coldwater Creek based on the distance along the centerline of the groundwater plume from the source. Although the groundwater plume boundaries have not been completely defined, the distance used in the referenced equation is greater than one-half mile. The

HWP, in consultation with Mr. Joe Haake of Boeing, believes that the distance should be closer to one-third of a mile. Using one-third as opposed to one-half mile increases the concentration of tetrachloroethene estimated to be discharging into Coldwater Creek by seven orders of magnitude. Using one-third mile as the approximate distance and the solubility limits of VOCs detected at the source of release, the HWP generated the attached Table 1 by using the above-referenced Equation 10 to estimate the VOC concentrations discharging into Coldwater Creek as a worst case dissolved-phase scenario for comparison with the risk-based protection standards.

The Facility Location Map on Figure 1-1 of the draft RFI Report does not include a scale to facilitate measurement of the actual distance between SWMU #17 and Coldwater Creek. In addition, the above-referenced Equation 10 appears incomplete as it does not include the second component of source width function (erf) in the vertical plane in accordance with the equation parameters defined on Page 8 of Appendix C. Thus, reevaluation of groundwater concentrations discharging to Coldwater Creek, in conjunction with further delineation of the horizontal/vertical extent of groundwater contamination related to SWMU #17, is necessary to support the risk assessment-related conclusions and recommendations presented in the RFI Report. This reevaluation should be done carefully as it is apparent that seemingly small differences in the input parameters can result in significant changes in the evaluation results.

Additional Comments:

24. The MDNR has received from Mr. Rod Brotherton, U.S. Navy, a draft report via email entitled "Environmental Baseline Survey for Transfer (EBST) dated November 1999, and prepared by the U.S. Navy for the Naval Weapons Industrial Reserve Plant which is an integral part of Boeing's production facility in St. Louis, Missouri. The draft report was prepared to assess any human health or safety risks associated with existing environmental conditions within the property boundaries, and determine if corrective actions are necessary to protect human health and the environment prior to effecting any proposed real property transaction.

The draft EBST report includes recommendations for further actions at several units located inside and outside of Building 27 within the subject property. The conditions of these areas are categorized based on actual/potential release(s) of hazardous waste or hazardous constituents to the environment. As you are aware, these areas were not identified during the RFA or in Boeing's permit application. Boeing is reminded that the Part I Permit requires Boeing to notify

MDNR in a timely manner of any new SWMUs/AOCs and/or release(s) not previously identified in the RFA or permit application.

One of the units, a Scrap Dock Area (Recycling Center) is evidently contaminated with hydrocarbons and Polychlorinated Biphenyl (PCB) based on Boeing's past subsurface investigation conducted there in 1992. As referenced in the EBST report, Boeing environmental personnel indicated that remediation of contaminated soils at the scrap dock was recommended subsequent to the results of the initial investigation. No remedial action has been initiated to-date, and no soil and groundwater analytical data was provided in the EBST report. It is also stated that PCB concentrations in the soil samples exceeded the U.S. EPA's Region III Risk-Based Concentrations for PCB in industrial soils of 2.9 mg/kg.

Based on the information presented in the EBST report, the MDNR concurs with the EBST report's conclusions and recommendations for further corrective action at the referenced units and hereby directs Boeing to address corrective action, including any screening evaluation, investigation and/or remediation, at these units under the RFI requirements of the Part I Permit. Boeing may use information and data from previous investigation at the Scrap Dock Area in defining the nature and scope of further investigations, provided that such information/data is relevant, appropriate, and meets standard Quality Assurance/Quality Control (QA/AC) requirements in accordance with SW-846 and addresses applicable elements of other EPA QA/QC related guidance. Further assessment of the areas referenced in the recommendations section of the EBST report, with the exception of the Scrap Dock Area, appears to be necessary to determine if a release(s) of hazardous waste and/or hazardous constituents to the environment has occurred, and if so, further investigation may be necessary to determine the nature and extent of such releases.

Boeing is hereby directed to prepare and submit a focused RFI Work Plan Addendum including a groundwater monitoring plan for SWMU #17 and investigation/assessment of the units identified in the EBST report to address the foregoing comments. This Work Plan must specify the investigation elements for soil and groundwater along with the technical rationale supporting the proposed plan, but may rely on/reference the approved QA/QC and generic sampling provisions of the original RFI Work Plan. The focused RFI Work Plan Addendum shall be submitted to the HWP and EPA within 60 days of receipt of this letter. Two copies of the focused RFI Work Plan should be sent to me, and one copy to Mr. Jerome Johnson, U.S. EPA Region VII. This Work Plan will be reviewed and approved in accordance with the Corrective Action Condition XIII of the Part I Permit. Data collected during Implementation of the approved work plan shall be incorporated in a final RFI Report. The schedule for

completing the final RFI Report shall be specified in the focused RFI Work Plan. The deficiencies and comments identified herein that must be addressed in the final RFI Report may be deferred until such time as that report is resubmitted.
If you have any questions concerning this letter or wish to schedule a meeting to discuss the issues identified herein or the focused RFI Work Plan submittal, please do not hesitate to contact me or Richard Nussbaum, P.E., R.G., at (573) 751-3553.

Sincerely,

HAZARDOUS WASTE PROGRAM

Fuad Marmash
Environmental Engineer
Permits Section

FM:la

Enclosure

c: Ms. Patricia Murrow, EPA Region VII
Mr. Jerome Johnson, EPA Region VII
Mr. Rod Brotherton, U.S. Navy (electronic copy)

TABLE 1 - Input of VOCs' Solubility Limit at the Source of Release for Prediction of Groundwater Contaminants Discharging to Coldwater Creek

Constituent	C_{source}[1] (mg/L)	X (cm)	$\alpha\chi$ (cm)	λ (1/day)	U (cm/day)	Sw (Sh) (cm)	αy (cm)	Sd (Sv) (cm)	αz (cm)	RME Cx (mg/L)
Benzene	1750	53108	5310.8	0.0009	0.1723	2740	1770.267	914	265.54	2.35501E-20
1,1-Dichloroethene	225	53108	5310.8	0.0053	0.1723	2740	1770.267	914	265.54	8.07326E-54
cis-1,2-Dichloroethene	3500	53108	5310.8	0.0002	0.1723	2740	1770.267	914	265.54	4.47201E-08
trans-1,2-Dichloroethene	6300	53108	5310.8	0.0002	0.1723	2740	1770.267	914	265.54	8.04963E-08
Tetrachloroethene	210	53108	5310.8	0.0009	0.1723	2740	1770.267	914	265.54	2.82601E-21
Toluene	526	53108	5310.8	0.011	0.1723	2740	1770.267	914	265.54	6.7456E-78
1,1,2-Trichloorethane	4420	53108	5310.8	0.0009	0.1723	2740	1770.267	914	265.54	5.94807E-20
Trichloroethene	1100	53108	5310.8	0.0004	0.1723	2740	1770.267	914	265.54	5.54672E-13
Vinyl Chloride	2760	53108	5310.8	0.0002	0.1723	2740	1770.267	914	265.54	3.5265E-08
Total VOCs										1.60482E-07

[1] Values of C_{source} are solubility limits, except tetrachloroethene which was detected at a concentraiton of 210 mg/l at TP-1 exceeding the solubility limit of 200 mg/l.